Electrostatics

SYNOPSIS

- **Coulomb's Law:**

- SI unit of electric intensity is NC^{-1}

- Dimensions

- The electric intensity due to isolated point charge,

- Electric dipole moment, P = q (2a) ,

  SI unit is C m

- Torque on a dipole,

  If θ = 0 or 180 then

- **Electric potential, V = $\frac{W}{q}$.**

  Its SI unit is volt and dimensions

- Electric potential due to isolated point charge,

V =

- Work done to move a charge ‘q’ from one point to another,

W = Pot. diff x q

- Electric flux, ø= Σ E Cos θ ds,

  Electric flux is scalar quantity.

- Capacitance of conductor,

  Its SI unit is farad.

- Capacitance of spherical conductor,

- Energy stored in a capacitor,

- Relation between electric intensity and potential,

- Gauss theorem

- Capacitance of parallel plate capacitor,

C=

- Capacitance of spherical capacitor,

- Capacitance of cylindrical capacitor,

- Series combination of capacitors,

For ‘n’ identical capacitors,

- Parallel combination of capacitors, $C_p = C_1 + C_2 + C_3$
  For 'n' identical capacitors, $C_p = n\,C$

- For two capacitors in parallel, the common potential ,

$V =$

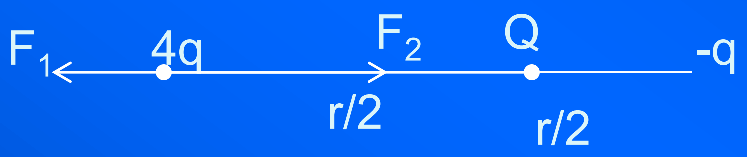
- If 'n' small drops each having a charge 'q' , capacity 'C' and potential 'V' combine to form a big drop, then

1. The charge on big drop, Q' = n q
2. The surface density of charge of big drop,

3. Capacitance of big drop, =

1)Two charges 4q and –q are placed a distance 'r' apart. A charge Q is placed exactly mid-way between them. What will be the value of Q so that charge 4q experiences no net force?

- q/4
- -q/4
- 4q
- -4q



force on 4q due to -q

$$F_1 = \frac{1}{4\pi\varepsilon_0}\frac{4q\times q}{r^2}$$

Force on 4q due to Q

$$F_1 = \frac{1}{4\pi\varepsilon_0}\frac{4q\times Q}{(r/2)^2}$$

Net force on 4q is zero

$F_1 = F_2$

Two charges 4q and –q are placed a distance 'r' apart. A charge Q is placed exactly mid-way between them. What will be the value of Q so that charge 4q experiences no net force?

- q/4
- -q/4
- 4q
- -4q

2)Two point charges of +4μC and +2μc repel each other with a force of 8N. If a charge of –4μ C is added to each of these charges, the force would be

- Zero
- 8N
- 4N
- 12N

PHYSICS

Two point charges of +4 μC and +2μc repel each other with a force of 8N. If a charge of –4 μC is added to each of these charges, the force would be

- **Zero**
- 8N
- 4N
- 12N

3)Force between two charges separated by a certain distance in air is 'F'. If each charge were doubled and distance between them also doubled, Force would be

- 2F
- F
- 4F
- F/4

PHYSICS

$$F = \frac{1}{4\pi\epsilon_0}\frac{q_1 q_2}{d^2}$$

$$F' = \frac{1}{4\pi\epsilon_0}\frac{2q_1 \times 2q_2}{(2d)^2} = F$$

Force between two charges separated by a certain distance in air is 'F'. If each charge were doubled and distance between them also doubled, Force would be

- 2F
- F
- 4F
- 14F

4)Two point charges certain distance apart in air repel each other with a force F. A glass plate is introduced between the charges. The force becomes F^1 where

1) $F^1 < F$
2) $F^1 = F$
3) $F^1 > F$
4) Data is insufficient.

$$F' \, \alpha \, \frac{1}{\varepsilon_r}, \quad \text{for glass} \quad \varepsilon_r > 1$$

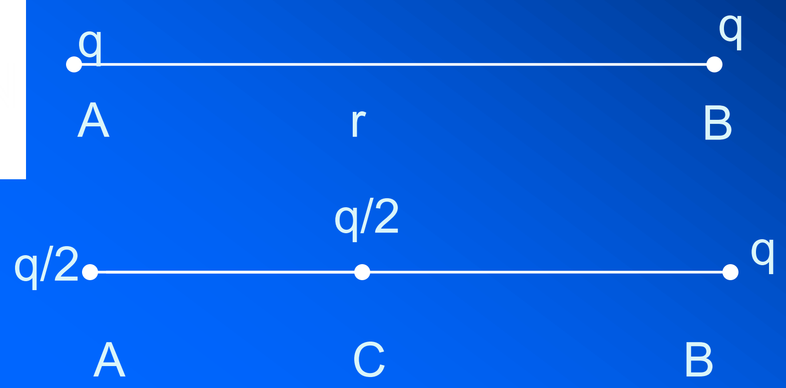
$$\therefore \; F' < F$$

Two point charges certain distance a port in air repel each other with a force F. A glass plate is introduced between the charges. The force becomes F^1 where

1) $F^1 < F$
2) $F^1 = F$
3) $F^1 > F$
4) Data is insufficient.

5)Two equally charged identical metal spheres A and B repel each other with a force $3X10^{-5}$ N. Another identical uncharged sphere c is touched with A and then placed at the mid point between A and B. Net force on 'c' is

1) $1x10^{-5}$ N
2) $2x10^{-5}$ N
3) $1.5x10^{-5}$ N
4) $3x10^{-5}$ N



After contact

Net force on c

$$= F_{BC} - F_{AC}$$

$$= \frac{1}{4\pi\varepsilon_0}\left\{\frac{\frac{q}{2}q}{\left(\frac{r}{2}\right)^2} - \frac{\frac{q}{2}\frac{q}{2}}{\left(\frac{r}{2}\right)^2}\right\} = \frac{1}{4\pi\varepsilon_0}\frac{qq\times4}{r^2}\left(\frac{1}{2}-\frac{1}{4}\right)$$

$$= \frac{1}{4\pi\varepsilon_0}\frac{q\times q}{r^2}$$

$$= 3\times10^{-5}\,N$$

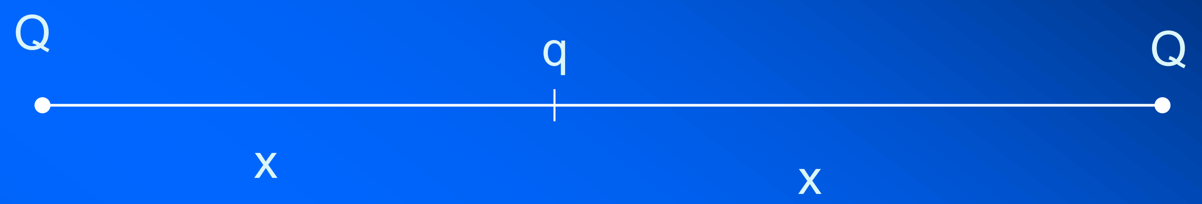
Two equally charged identical metal spheres A and B repel each other with a force $3X10^{-5}$ N. Another identical uncharged sphere c is touched with A and then placed at the mid point between A and B. Net force on 'c' is

1) $1x10^{-5}$ N
2) $2x10^{-5}$ N
3) $1.5x10^{-5}$ N
4) $3x10^{-5}$ N

6) If charge q is placed at the centre of the line joining two equal charges Q. The system of three charges will be in equilibrium if q is

- -Q/2
- -Q/4
- -4Q
- +Q/2

PHYSICS



If charge q is placed at the centre of the line joining two equal charges Q. The system of three charges will be in equilibrium if q is

- -Q/2
- -Q/4
- -4Q
- +Q/2

7) In one gram of a solid, there are 5×10^{21} atoms. If one electron is removed from every one of 0.01% of the solid, the charge gained by the solid is

- +0.08c
- +0.8c
- -0.08c
- -0.8c

PHYSICS

$$n = \frac{0.01}{100} \times 5\times10^{21} = 5\times10^{17}$$

In one gram of a solid, there are 5×10^{21} atoms. If one electron is removed from every one of 0.01% of the solid, the charge gained by the solid is

- +0.08c
- +0.8c
- -0.08c
- -0.8c

8) When air is replaced by dielectric medium of constant k the maximum force of attraction between two charges separated by a distance

- **Increases k^{-1} times**
- **Increases k times**
- **Remains unchanged**
- **decreases k times**

When air is replaced by dielectric medium of constant k the maximum force of attraction between two charges separated by a distance

- Increases k^{-1} times
- Increases k times
- Remains unchanged
- decreases k times

9) In paper and cotton industries, the atmosphere is kept moist. This is to

- Remove dust and dirt
- Conduct the charges produced due to friction as material is dried
- Reduce the temperature of surrounding
- Prolong process of drying

Due to action of points, sparking occurs. Hence conduct the charges

In paper and cotton industries, the atmosphere is kept moist. This to

- Remove dust and dirt
- Conduct the charges produced due to friction as material is dried
- Reduce the temperature of surrounding
- Prolong process of drying

10) The statement which is incorrect is

- Gravitational force may be attractive while electrostatic force may be attractive or repulsive
- Both gravitational and electrostatic forces very inversely as the square of the distance
- Gravitational force is a short range force while electrostatic force is a long range force
- Gravitational force is very weak compared to electrostatic force

Gravitational force and electrostatic force are long range forces

The statement which is incorrect is

- Gravitational force may be attractive while electrostatic force may be attractive or repulsive
- Both gravitational and electrostatic forces very inversely as the square of the distance
- Gravitational force is a short range force while electrostatic force is a long range force
- Gravitational force is very weak compared to electrostatic force

11) There is an electric field E in X-direction. If work done in moving a charge 0.2C through a distance of 2m along a line making an angle of 60^0 with X-axis is 4J, what is the value of E?

1) $\sqrt{3}$ NC^{-1}
2) $4Nc^{-1}$
3) $5NC^{-1}$
4) none of these

$W = ES\cos\theta$

$W = qES\cos\theta$

$4 = 0.2 \times E \times 2 \times \cos 60^{\circ}$

$E = 20\,NC^{-1}$

There is an electric field E in X-direction. If work done in moving a charge 0.2c through a distance of 2m along a line making are angle of 60^0 with X-axis is 4J, what is the value of E?

1) $\sqrt{3}NC^{-1}$

2) $4Nc^{-1}$

3) $5NC^{-1}$

4) none of these

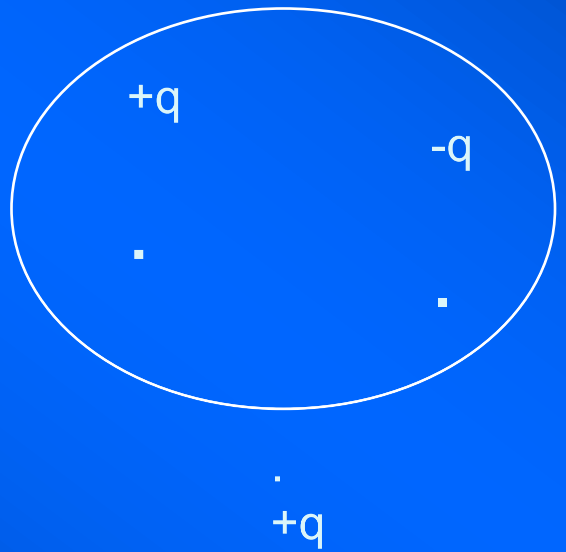
12) Shown below is a distribution of charges. The flux of electric field due to these charges through the surface is

1) $\frac{3q}{\varepsilon_0}$

2) zero

3) $\frac{2q}{\varepsilon_0}$

4) $\frac{q}{\varepsilon_0}$



Charges present outside the surface make no contribution to electric flux

$$\Phi = \frac{1}{\varepsilon_0}\{q - q\} = 0$$

Shown below is a distribution of charges. The flux of electric field due to these charges through the surface is

4) zero

13) If the electric flux entering and leaving an enclosed surface respectively is ø1 and ø2 the electric charge inside the surface will be

1) $\frac{\phi_2 - \phi_1}{\varepsilon_0}$

2) $\frac{\phi_1 + \phi_2}{\varepsilon_0}$

3) $\frac{\phi_1 - \phi_2}{\varepsilon_0}$

4) $\varepsilon_0(\phi_1 + \phi_2)$

PHYSICS

If the electric entering and leaving an enclosed surface respectively is ø1 and ø2 the electric charge inside the surface will be

1) $\frac{\phi_2 - \phi_1}{\varepsilon_0}$

2) $\frac{\phi_1 + \phi_2}{\varepsilon_0}$

3) $\frac{\phi_1 - \phi_2}{\varepsilon_0}$

4) $\varepsilon_0(\phi_1 + \phi_2)$

14) Two metal pieces having a potential difference of 800V are 0.02m apart horizontally. A particle of mass $1.96x10^{-15}$ Kg is suspended in equilibrium between the plates. If 'e' is the elementary charge, then charge on particle is

- 8e
- 6e
- 3e
- e

PHYSICS

Two metal pieces having a potential difference of 800v are 0.02m apart horizontally. A particle of mass 1.96x10^{-15} Kg is suspended in equilibrium between the plates. If 'e' is the elementary charge, then charge on particle is

- 8e
- 6e
- 3e
- e

15) An electron is projected into a region of uniform electric field with a velocity v such that it moves in the direction of the field. As the electron moves , its velocity

- **Remains the same**
- **Increases**
- **Decreases**
- **Continuously charges in direction**

Since electron is negatively charged, it experiences a force opposite to the direction of the field E. This means the electron moves against the force acting on it. Hence its velocity decreases.

An electron is projected into a region of uniform electric field with a velocity v such that it moves in the direction of the field. As the electron moves , its velocity

- Remains the same
- Increases
- Decreases
- Continuously charges in direction

16) If a particle of mass ‘m’ and charge +q moves from rest in an electric field from a point at a higher potential to a point at a lower potential and V be the potential difference between the two points, then the velocity acquired by the particle is

1) $\sqrt{\frac{2qv}{m}}$

2) $\sqrt{\frac{2m}{qv}}$

3) $\sqrt{2mqv}$

4) $\sqrt{\frac{m}{2qv}}$

$$W = qV$$

$$= \frac{1}{2}mv^2$$

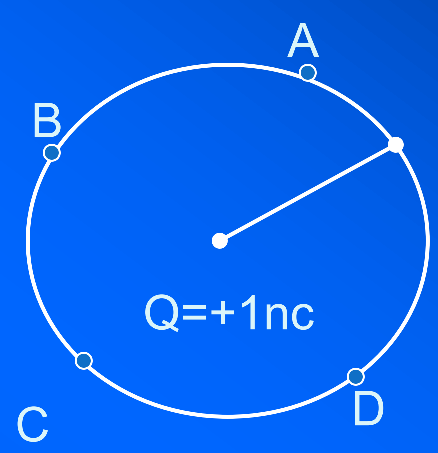
$$\therefore v = \sqrt{\frac{2qV}{m}}$$

If a particle of mass 'm' and charge +q moves from rest in an electric field from a point at a higher potential to a point at a lower potential and V_1 be the potential difference between the two points, then the velocity acquired by the particle is

1) $\sqrt{\frac{2qv}{m}}$ 2) $\sqrt{\frac{2m}{qv}}$ 3) $\sqrt{2mqv}$ 4) $\sqrt{\frac{m}{2qv}}$

17) A point charge of +1nc is at centre of circle of radius 5cm as shown in the diagram. A, B, C and D are points on the circumference of the circle. The amount of work done in taking +1c of charge is

- Greatest for the path AD
- Greatest for the path AB
- Same for the paths AC & BD
- Zero for all the paths



A, B, C and D are points on an equi potential line. Therefore work done is zero for all paths

A point charge of +1nc is at centre of circle of radius 5c.m. as shown in the diagram. A, B, C and D are points on the circumference of the circle. The amount of work done in taking +1c of charge is

- Greatest for the path AD
- Greatest for the path AB
- Same for the paths AC & BD
- Zero for all the paths

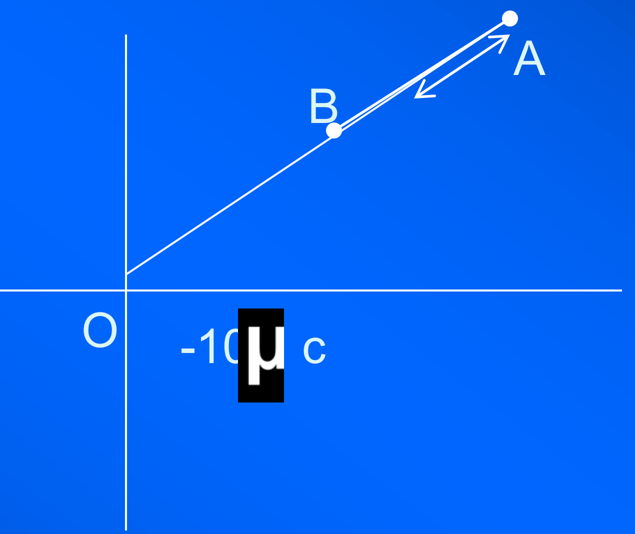
18) A particle of mass 6mg carrying a charge of -1μc is projected with a velocity v towards a charge of -10μc from a point A as shown in the diagram. It comes to rest at a point B distant 1m from 'O' and then turns back. Then v is nearly

1) $100 ms^{-1}$

2) $173 ms^{-1}$

3) $500 ms^{-1}$

4) $325 ms^{-1}$



A particle of mass 6mg carrying a charge of -1μc is projected with a velocity v towards a charge of -10μc from a point A as shown in the diagram. It comes to rest at a point B distant 1m from 'O' and then turns back. Then v is nearly

- $100 ms^{-1}$
- $173 ms^{-1}$
- $500 ms^{-1}$
- $325 ms^{-1}$

19) The number of electrons to be removed from a neutral copper sphere of radius 1m in order that there exists an electric intensity of $9vm^{-1}$ on the surface of the sphere is

1) $625x10^7$

2) $6.25x10^7$

3) $625x10^8$

4) $6.25x10^8$

PHYSICS

The number of electron to be removed from a neutral copper sphere of radius 1m in order that there exists an electric intensity of $9vm^{-1}$ on the surface of the sphere is

- $625x10^7$
- $6.25x10^7$
- $625x10^8$
- $6.25x10^8$

20) Can a sphere of radius 1m hold a charge of 1c?

- Yes
- No
- Depends upon the metal of the sphere
- Depends upon whether the charge is +ve or-ve

PHYSICS

Can a sphere of radius 1m hold a charge of 1c?

- Yes
- No
- Depends upon the metal of the sphere
- Depends upon whether the charge is +ve or-ve

21) The energy stored in a capacitor is actually stored

- Between the plates
- On the positive plate
- On the negative plate
- On the outer surface of the plates

We know that the energy stored in a capacitor is in the form of electrostatic energy. It is actually stored in the electric field between the plates of

the capacitor

The energy stored in a capacitor is actually stored

- Between the plates
- On the positive plate
- On the negative plate
- On the outer surface of the plates

22) If an uncharged capacitor is charged by connecting it to a battery, then the amount of energy lost as heat is

1) $\frac{1}{2}QV$ 2) QV

3) $\frac{1}{2}QV^2$ 4) QV^2

If an uncharged capacitor is charged by connecting it to a battery, then the amount of energy lost as heat is

1) $\frac{1}{2}QV$

23) A variable capacitor is permanently connected to a 100volt battery. If the capacity is changed from 2μF to 10μF, then the change in energy is equal to

- 2×10^{-1} J
- 2.2×10^{-2} J
- 3.5×10^{-2} J
- 4×10^{-2} J

$$\Delta U = \frac{1}{2}(C_2 - C_1)V^2$$

$$= \frac{1}{2}(10 - 2) \times 10^{-6} \times 100^2$$

$$= 4 \times 10^{-2}\ J$$

A variable capacitor is permanently connected to a 100volt battery. If the capacity is changed from 2µF to 10µF, then the change in energy is equal to

- 2×10^{-1} J
- 2.2×10^{-2} J
- 3.5×10^{-2} J
- 4×10^{-2} J

24) The capacity of a parallel plate capacitor depends on

- The type of metal used
- The thickness of plates
- The potential applied across the plates
- The separation between the plates

PHYSICS

The capacity of a parallel plate capacitor depends on

- The type of metal used
- The thickness of plates
- The potential applied across the plates
- The separation between the plates

25) A capacitor of capacitance 6μF was originally charged to 10volt. Now the potential difference is made 20volt. What is the increase in its potential energy?

- $3x10^{-4}$J
- $6x10^{-4}$J
- $9x10^{-4}$J
- $12x10^{-4}$J

$$U_1 = \frac{1}{2}cv^2 = \frac{1}{2}x6x10^{-6}x10^2 = 3x10^{-4}J$$

$$U_2 = \frac{1}{2}cv^2 = \frac{1}{2}x6x10^{-6}x20^2 = 12x10^{-4}J$$

$$\Delta U = U_2 - U_1 = 9x10^{-4}J$$

A capacitor of capacitance 6μF was originally charged to 10volt. Now the potential difference is made 20volt. What is the increase in its potential energy?

- 3×10^{-4}J
- 6×10^{-4}J
- 9×10^{-4}J
- 12×10^{-4}J

26) Two copper spheres of same radius, one hollow and the other solid are charged to the same potential, then

- The hollow sphere will hold more charge
- The solid sphere will hold more charge
- Both of them will hold same charge
- Hollow sphere cannot hold any charge

Charge resides only on the outer surface of the conductor

Two copper spheres of same radius, one hollow and the other solid are charged to the same potential, then

- The hollow sphere will hold more charge
- The solid sphere will hold more charge
- Both of them will hold same charge
- Hollow sphere cannot hold any charge

27) The capacitance of a capacitor does not depend upon

- Distance between the plates
- Area of the plates
- Curvature of the plates
- Material of the plates

$$C = \frac{\varepsilon_0 A}{d}$$

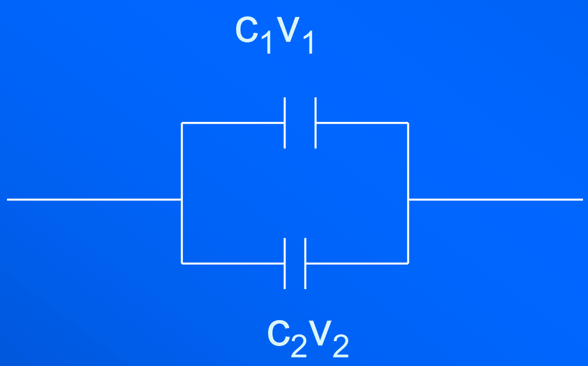
The capacitance of a capacitor does not depend upon

- Distance between the plates
- Area of the plates
- Curvature of the plates
- Material of the plates

28) Two capacitors with capacitances c_1 and c_2 are charged to potentials v_1 and v_2 respectively. When they are connected in parallel, the ratio of their respective charges is

1) $\frac{c_1^2}{c_2^2}$ 2) $\frac{v_1^2}{v_2^2}$ 3) $\frac{v_1}{v_2}$ 4) $\frac{c_1}{c_2}$

PHYSICS



In parallel combination they attain common p.d.

$Q_1=c_1v$

$Q_2=c_2v$

$$\frac{Q_1}{Q_2}=\frac{c_1}{c_2}$$

Two capacitors with capacitances c_1 and c_2 are charged to potentials v_1 and v_2 respectively. When they are connected in parallel, the ratio of their respective charges is

1) $\frac{c_1^2}{c_2^2}$

2) $\frac{v_1^2}{v_2^2}$

3) $\frac{v_1}{v_2}$

4) $\frac{c_1}{c_2}$

29) Three capacitors each of capacity 4μF are to be connected in such a way that the effective capacitance is 6μF, this can be done by

- Connecting all of them in series
- Connecting all of them in parallel
- Connecting two in series and one in parallel
- Connecting two in parallel and one in series

Three capacitors each of capacity 4μF are to be connected in such a way that the effective capacitance is 6μF, this can be done by

- Connecting all of them in series
- Connecting all of them in parallel
- Connecting two in series and one in parallel
- Connecting two in parallel and one in series

30) Three capacitors of capacity C each are joined first in series and then in parallel. The capacity becomes n times, where n is

- 3
- 6
- 9
- 12

PHYSICS

Three capacitors of capacity C each are joined first in series and then in parallel. The capacity becomes n times, where n is

- 3
- 6
- 9
- 12

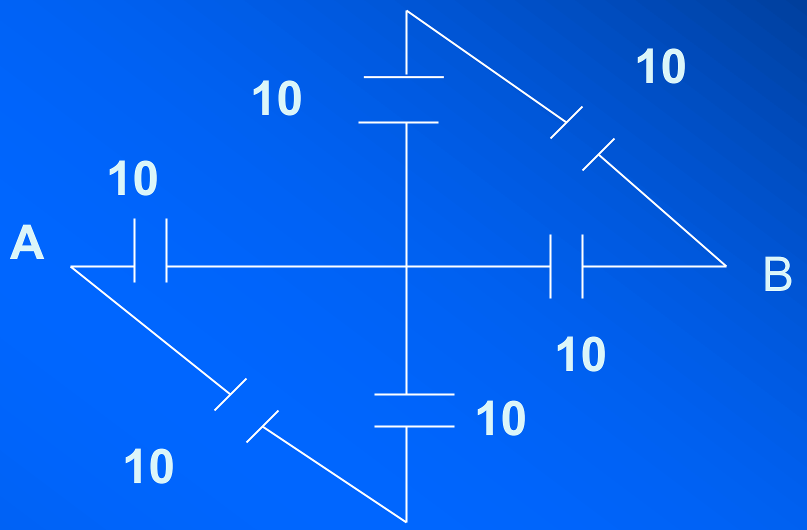
31) The effective capacitance between A and B is

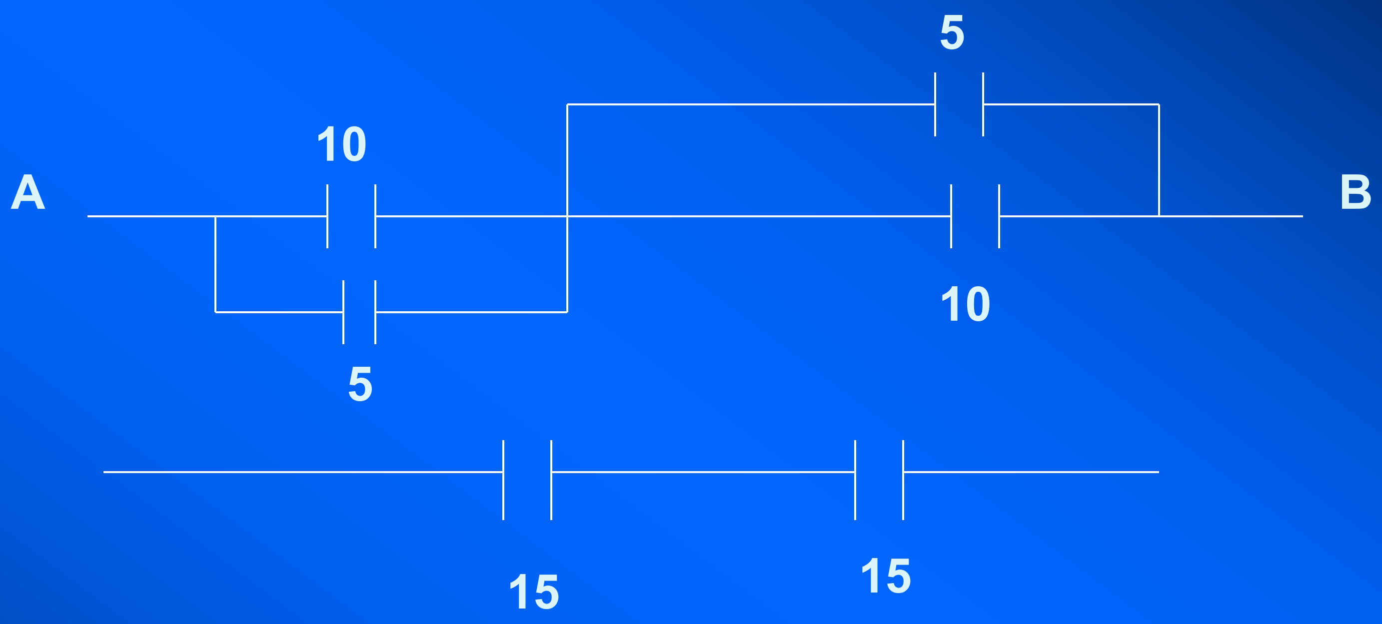
1) $15\mu F$

2) $\frac{20}{3}\mu F$

3) $\frac{15}{2}\mu F$

4) $40\mu F$





$$C_{AB} = \frac{15}{2}\mu F$$

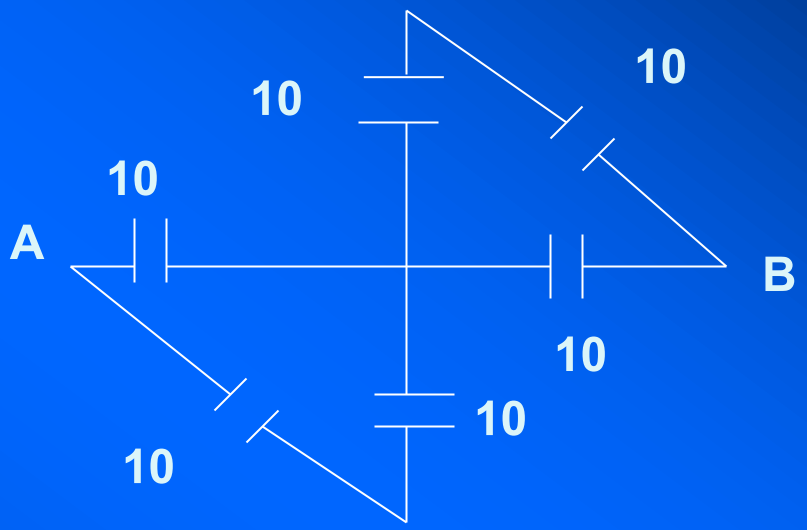
The effective capacitance between A and B is

1) $15\mu F$

2) $\frac{20}{3}\mu F$

3) $\frac{15}{2}\mu F$

4) $40\mu F$



32) In a parallel plate capacitor of capacitance c, a sheet of copper is inserted between the plates, parallel to them. The thickness of the sheet is half the separation between the plates. The capacitance now becomes

- 2c c/2
- 4c c/4

PHYSICS

In a parallel plate capacitor of capacitance c, a sheet of copper is inserted between the plates, parallel to them. The thickness of the sheet is half the separation between the plates. The capacitance now becomes

- 2c
- 4c
- c/4
- c/2

33) Two conducting spheres of radii R_1 and R_2 are given the same charge. The ratio of their potentials will be

1) $\sqrt{\frac{R_2}{R_1}}$

2) $\frac{R_2}{R_1}$

3) $\frac{R_2^2}{R_1^2}$

4) $\frac{R_2^3}{R_1^3}$

$$V \propto \frac{1}{R}$$

$$\frac{V_1}{V_2} = \frac{R_2}{R_1}$$

Two conducting spheres of radii R_1 and R_2 are given the same charge. The ratio of their potentials will be

1) $\sqrt{\frac{R_2}{R_1}}$

2) $\frac{R_2}{R_1}$

3) $\frac{R_2^2}{R_1^2}$

4) $\frac{R_2^3}{R_1^3}$

34) Two conducting spheres of radii r_1 and r_2 are charged such that they have the same electric field on their surfaces. The ratio of the charge on them is

1) $\sqrt{\frac{r_1}{r_2}}$

2) $\frac{r_1}{r_2}$

3) $\frac{r_1^2}{r_2^2}$

4) $\sqrt{\frac{r_2}{r_1}}$

PHYSICS

Two conducting spheres of radii r_1 and r_2 are charged such that they have the same electric field on their surfaces. The ratio of the charge on them is

1) $\sqrt{\frac{r_1}{r_2}}$

2) $\frac{r_1}{r_2}$

3) $\frac{r_1^2}{r_2^2}$

4) $\sqrt{\frac{r_2}{r_1}}$

35) A parallel plate capacitor is charged and is disconnected from the battery. If the plates of the capacitor are moved apart by means of insulating handles,

- The charge on the capacitor becomes zero
- The capacitance becomes infinity
- The charge on capacitor increases
- Voltage across the plates increases

If the plates of capacitor are moved apart its capacitance c decreases. But charge Q remains the same. Since Q=cv, voltage across the plates increases

A parallel plate capacitor is charged and is disconnected from the battery. If the plates of the capacitor are moved apart by means of insulating handles

- The charge on the capacitor becomes zero
- The capacitance becomes infinity
- The charge on capacitor increases
- Voltage across the plates increases

36) A parallel plate capacitor with oil between the plates (dielectric constant of oil K=5) has capacitance c. If the oil is removed, then capacitance of the capacitor becomes

1) $\frac{c}{5}$

2) $\frac{c}{\sqrt{5}}$

3) $5c$

4) $\sqrt{5c}$

PHYSICS

When oil is removed

A parallel plate capacitor with oil between the plates (dielectric constant of oil K=5) has capacitance c. If the oil is removed, then capacitance of the capacitor becomes

1) $\frac{c}{5}$

2) $\frac{c}{\sqrt{5}}$

3) $5c$

4) $\sqrt{5c}$

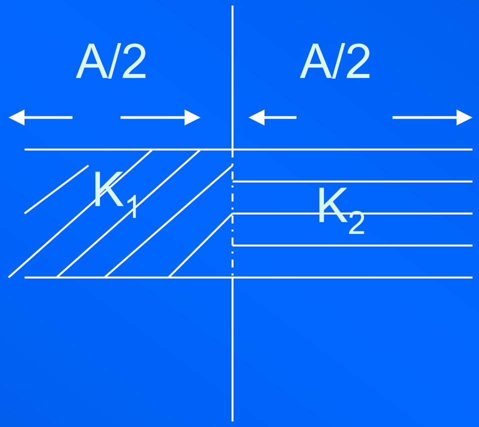
37) A parallel plate air capacitor has a capacitance of 1μF. The space between its plates is then filled with two slabs of dielectric constants K_1=2 and K_2=4 as shown. The new capacitance is

1) 5μF

2) 10μF

3) 3μF

4) 4μF



PHYSICS

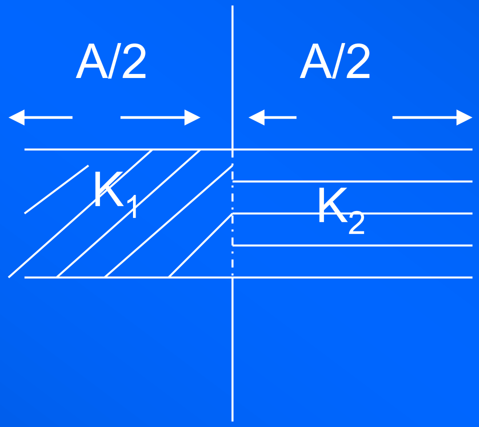
A parallel plate air capacitor has a capacitance of 1μF. The space between its plates is then filled with two slabs of dielectric constants $K_1=2$ and $K_2=4$ as shown. The new capacitance is

1) 5μF

2) 10μF

3) 3μF

4) 4μF



38) A particle of mass m and charge q is placed at rest in a uniform electric field E and then released. The kinetic energy attained by the particle after moving a distance y is

- qEy^2
- qE^2y
- qEy
- q^2Ey

K.E. acquired=work done

=force x distance

=qE x y

=qEy

A particle of mass m and charge q is placed at rest in a uniform electric field E and then released. The kinetic energy attained by the particle after moving a distance y is

- qEy^2
- qE^2y
- qEy
- q^2Ey

39) An alpha particle is accelerated through a potential difference of 10^6volt. Its kinetic energy will be

- 1Mev
- 2Mev
- 4Mev
- 8Mev

Charge on alpha particle $=q=2e$

K.E.=work done

$=q \times v$

$=2e \times 10^6$

$=2Mev$

An alpha particle is accelerated through a potential difference of 10^6volt. Its kinetic energy will be

- 1Mev
- 2Mev
- 4Mev
- 8Mev

40) In bringing an electron towards another electron, the electrostatic potential energy of the system

- remains same
- becomes zero
- increases
- decreases

PHYSICS

In bringing an electron towards another electron, the electrostatic potential energy of the system

- remains same
- becomes zero
- increases
- decreases

41) Two spheres of radii R_1 and R_2 respectively are charged and joined by a wire. The ratio of electric field of sphere is

1) $\frac{R_2^2}{R_1^2}$

2) $\frac{R_1^2}{R_2^2}$

3) $\frac{R_2}{R_1}$

4) $\frac{R_1}{R_2}$

PHYSICS

Two spheres of radii R_1 and R_2 respectively are charged and joined by a wire. The ratio of electric field of sphere is

1) $\frac{R_2^2}{R_1^2}$ 2) $\frac{R_1^2}{R_2^2}$ 3) $\frac{R_2}{R_1}$ 4) $\frac{R_1}{R_2}$

42) The electric potential v is given as a function of distance x (metre) by $v=5x^2+10x-4$. Value of electric field at x=1metre is

- -23v/m
- 11v/m
- 6v/m
- -20v/m

$$v = 5x^2 + 10x - 4$$

$$E = -\frac{dv}{dx} = -(10x + 10)$$

$$At\ x = 1\,metre$$

$$E = -20\,v/m$$

The electric potential v is given as a function of distance x (metre) by $v=5x^2+10x-4$. Value of electric field at x=1metre is

- -23v/m
- 11v/m
- 6v/m
- -20v/m

43) An alpha particle and a proton are accelerated through same potential difference from rest. Find the ratio of their final velocity.

1) $\sqrt{2} : 1$

2) $1 : 1$

3) $1 : \sqrt{2}$

4) $1 : 2$

PHYSICS

$$eV = \frac{1}{2}mv^2$$

$$v = \sqrt{\frac{2eV}{m}}$$

$$\frac{v_\alpha}{v_p} = \sqrt{\frac{q_\alpha}{m_\alpha} \times \frac{m_p}{q_p}}$$

$$= \sqrt{\frac{2e}{4m_p} \times \frac{m_p}{e}} = \frac{1}{\sqrt{2}}$$

PHYSICS

An alpha particle and a proton are accelerated through same potential difference from rest. Find the ratio of their final velocity.

1) $\sqrt{2} : 1$

2) $1 : 1$

3) $1 : \sqrt{2}$

4) $1 : 2$

44) The potential difference applied to a x-ray tube is 5kv and current through it is 3.2mA. Then the number of electrons striking the target per second is

- $2x10^{16}$
- $5x10^{6}$
- $1x10^{7}$
- $4x10^{15}$

The potential difference applied to a x-ray tube is 5kv and current through it is 3.2mA. Then the number of electrons striking the target per second is

- 2×10^{16}
- 5×10^{6}
- 1×10^{7}
- 4×10^{15}

45) Equal charges q each are placed at the vertices A and B of an equilateral triangle of side a. the magnitude of electric intensity at the point c is

1) $\frac{1}{4\pi\varepsilon_0}\frac{q}{a^2}$

2) $\frac{\sqrt{2}}{4\pi\varepsilon_0}\frac{q}{a^2}$

3) $\frac{\sqrt{3}}{4\pi\varepsilon_0}\frac{q}{a^2}$

3) $\frac{2}{4\pi\varepsilon_0}\frac{q}{a^2}$

Equal charges q each are placed at the vertices A and B of an equilateral triangle of side a. the magnitude of electric intensity at the point c is

1) $\frac{1}{4\pi\varepsilon_0}\frac{q}{a^2}$

2) $\frac{\sqrt{2}}{4\pi\varepsilon_0}\frac{q}{a^2}$

3) $\frac{\sqrt{3}}{4\pi\varepsilon_0}\frac{q}{a^2}$

3) $\frac{2}{4\pi\varepsilon_0}\frac{q}{a^2}$

46) 27 identical drops of mercury are charged simultaneously to the same potential of 10volt each. Assuming drops to be spherical, if all the charged drops, are combined to form a single large drop, then potential, of larger drop would be

- 45V
- 135V
- 270V
- 90V

PHYSICS

27 identical drops of mercury are charged simultaneously to the same potential of 10volt each. Assuming drops to be spherical, if all the charged drops, are combined to form a single large drop, then potential, of larger drop would be

- 45V
- 135V
- 270V
- 90V

47) The capacitance of arrangement of 4 plates of area A at a distance d as shown in figure is

1) $\frac{\varepsilon_0 A}{d}$

2) $\frac{2\varepsilon_0 A}{d}$

3) $\frac{3\varepsilon_0 A}{d}$

4) $\frac{4\varepsilon_0 A}{d}$

The arrangement is equivalent to two capacitors joined in parallel

$$c = \frac{2\varepsilon_0 A}{d}$$

The capacitance of arrangement of 4 plates of area A at a distance d as shown in figure is

1) $\frac{\varepsilon_0 A}{d}$

2) $\frac{2\varepsilon_0 A}{d}$

3) $\frac{3\varepsilon_0 A}{d}$

4) $\frac{4\varepsilon_0 A}{d}$

48) A parallel plate capacitor is first charged and then a dielectric slab is introduced between the plates. The quantity that remains unchanged is

- Charge
- Potential
- Capacity
- energy

Once charged battery is disconnected. On introducing the slab charge remains unchanged

A parallel plate capacitor is first charged and then a dielectric slab is introduced between the plates. The quantity that remains unchanged is

- Charge
- Potential
- Capacity
- energy

49) Two capacitors of capacitances c_1 and c_2 are connected in parallel across a battery. If Q_1 and Q_2 respectively be the charges on the capacitors, then Q_1/Q_2 will be equal to

1) $\frac{c_2}{c_1}$ 2) $\frac{c_1}{c_2}$ 3) $\frac{c_1^2}{c_2^2}$ 4) $\frac{c_2^2}{c_1^2}$

In parallel combination potential is same

$Q_1 \quad C_1V \quad C_1$

$Q_2 \quad C_2V \quad C_2$

Two capacitors of capacitances c_1 and c_2 are connected in parallel across a battery. If Q_1 and Q_2 respectively be the charges on the capacitors, then Q_1/Q_2 will be equal to

1) $\frac{c_2}{c_1}$ 2) $\frac{c_1}{c_2}$ 3) $\frac{c_1^2}{c_2^2}$ 4) $\frac{c_2^2}{c_1^2}$

50) The surface encloses an electric dipole. The electric flux through the surface is

- Zero
- Positive
- Negative
- infinity

From Gauss theorem

$$\Phi = \frac{+q}{\varepsilon_0} + \frac{-q}{\varepsilon_0} = 0$$

The surface encloses an electric dipole. The electric flux through the surface is

- Zero
- Positive
- Negative
- infinity

Thank you

Wish you all the best